
Hayes dialing

Like keyboard dialing, Hayes dialing is an interactive dialing mode with the terminating equipment connected to the NT7D16 Data Access Card (DAC). In addition to the common parameters and functions, the Hayes dialing mode offers the following features:

- Data call dialing
- Two modes for answering incoming calls: auto and manual
- Repeat previous command
- Character echo control
- On-hook/off-hook control
- Detect off-line escape sequence
- Return to on-line
- Initiate Remote Digital Loopback
- Terminate Remote Digital Loopback
- Modify S Registers S0 through S12
- Display S Registers S0 through S12
- Support all S Registers except: S6, S7, S9, and S11

The Hayes dialing mode supports the following AT Dialing commands

Initiating conditions

The DAC responds to commands only when the following initial requirements are met:

- the DAC is active
- the DAC has successfully received the downloaded parameters
- the user equipment is active, and, if operating in RS-232-C mode
 - the DCE mode is DTR (unless Forced DTR has been software selected)
 - the DTE mode, and RI has cycled the appropriate number of times and DCD is asserted on by the modem

Note: In Gateway mode, DCD must be asserted on. In modem mode, only RI must be on. The DAC asserts DTR to the modem, and awaits DCD from the modem.

Input requirements

All input must be in the same case (upper or lower).

The Hayes repeat command, A/, is used to immediately execute the last command entered. The terminator character need not be entered. A complete discussion of the Repeat command can be found later in this document.

Where a Dial Number is expected, you may enter the characters 0-9, #, and comma (,). The characters @, P, R, T, and W are accepted, but ignored.

The maximum number of characters is 43. This limit includes the AT prefix, and the record Terminator character, but does not include the ASCII space character.

Echo

Throughout the dialogue phase, the DAC echoes all user input. In RS-232-C modes 0, 1, 2, and 3, no inbound call messages are presented to the modem. Prompts are presented only if the modem user originates the call. In modes 8, 9, 10, and 11, no prompts or characters echo under any circumstances. The echo function can be turned off with a Hayes dialing command.

All prompts and responses issued by the system are displayed to the user unless the display command has been disabled. Like the Repeat command, this is explained later in this document.

Note: If the RS-232-C DAC Host modes (1, 2, 3, 8, 9, 10, 11, or 12) are used, all attempts to enable the echo or display is ignored. Likewise, the Hayes Reset command is also ignored.

Result codes and messages

Each input record generates a result code which is sent to the user. Only one code is sent regardless of the number of commands in the record. The reply is in one of two formats:

- Numeric replies contain a one- or two-number code
- Verbose replies contain one or more words

Table 4 shows the codes for each reply in both formats, and explanations for the codes.

Note 1: Verbose commands are the default and appear in upper case characters only. Numeric commands are sent by issuing the Numeric Results code command (explained later in this document).

Note 2: All verbose codes and messages are preceded and terminated by the user defined Terminator and New Line characters. The default, or reset, characters are the ASCII Carriage Return, and ASCII Line Feed. The Numeric codes are preceded and terminated by the Terminator character only.

Note 3: The Suppress result command (explained later in this document) will disable the sending of these codes. If in RS-232-C DAC Host modes, this command is ignored.

Table 4
Hayes dialing result codes and messages

Verbose code	Numeric code	Description
OK	0	Command(s) executed, no error
CONNECT	1	Data call established, session starts
RING	2	Inbound call presented
NO CARRIER	3	Data call abandoned
ERROR	4	Error in command line
NO DIALTONE	6	System does not allow call to proceed
BUSY	7	Far end is busy
NO ANSWER	8	Far end does not answer
CONNECT 1200	5	Session starts at 1200 baud
CONNECT 2400	10	Session starts at 2400 baud
CONNECT 4800	11	Session starts at 4800 baud
CONNECT 9600	12	Session starts at 9600 baud
CONNECT 19200	14	Session starts at 19200 baud

Baud rate detection

Every command line begins with Baud rate detection. This phase allows the DAC to determine the user equipment baud rate. During this phase, the DAC accepts only the ASCII "A," or "a" characters. Once a valid autobaud character is detected, the DAC echoes the parity bit character at the baud rate detected.

Note: If Hayes dialing is desired, you must enter the character “A” or “a” BEFORE the <CR>. If Carriage Return (<CR>) is entered before this Hayes dialing command, you will be placed in keyboard dialing mode.

Parity detection

Once the baud rate has been determined, the DAC accepts only the ASCII characters “T,” “t,” or “/.” If the Repeat character “/” is entered, the previous command is executed. If “T,” or “t” is entered, the DAC uses its parity and the parity of the preceding A (a) to determine the user's parity. This parity is used on the following messages and prompts associated with the command lines.

Note: The parity determined here overrides the parity downloaded from the system. Also, the T (t) must be entered in the same case as the A (a). If you entered uppercase A for the Baud Rate, you must enter upper case T for the parity.

Dialing operation

Like keyboard dialing, the Hayes dialing commands allow the user to initiate a data call, as well as change certain dialing parameters. The commands may be entered in either upper or lower case, but must be the same case throughout the command line. Also the case must match the autobaud case.

Note: Hayes dialing does not allow for the Ring Again feature. If a call is made to a busy number, that call is abandoned.

Table 5 provides a list of the AT dialing commands.

Table 5
AT dialing commands

Command	Description
ATA	Answer (answer incoming data call)
ATDnnnn ATDTnnnn	Dial (n = 0-9, numbers to be dialed)
A/	Repeat last command (no <CR> needed)
ATO	On-line (enter three Escape characters rapidly to go off-line)
ATDPnnnn	Voice call (n = 0-9, numbers to be dialed)
ATF0	Handsfree/mute (toggle Handsfree between mute and normal)
ATF1	Hold (put voice call on hold)
ATF2	Select (take voice call off hold)
ATH0	Hang up data call
ATHP	Hang up voice call
ATQn	Result code (n = 0, 1; if n = 0, result codes are sent)
ATVn	Verbal result (n = 0, 1; if n = 0, numeric codes are sent)
ATXn	Result code selection (n = 0, 1; if n = 1, extended results)
ATSn	Read S register (n = number of S register to read)
ATSn=x	Write S register (n = S register number; x = new value)
ATZ	Soft reset (reset to default parameters)
ATCn	Carrier detect (n = 0, 1; if n = 1, carrier detect is enabled)
ATEn	Echo (n = 0, 1; if n = 1, commands will echo back to terminal)
ATTSP!	Transparent mode
Note 1: To use AT dialing, enter CTRL-z at carriage return (<CR>) when the port is idle.	
Note 2: Follow each command (except A/) by a carriage return (<CR>) to execute it.	

For the purposes of this document, when illustrating the prompt/response sequences, the bold type is what the user enters on the keyboard. All other type represents the DAC output. Likewise, “xxxxxxx,” “yyyyyyy,” or “zzzzzzz” represents numbers entered by the user, or dialed by the DAC, and in no way indicates the absolute character limit. The number of characters is dependent on the feature activated (Auto Dial, Speed Call, for example). Also, for simplicity purposes, all Result messages are shown in Verbose code. See [Table 4](#) for a complete list of the Verbose and Numeric codes. See *X11 features and services* (553-3001-305) for a complete description of the features operating.

S registers

These commands allow the user to access various dialing parameters. The user can determine the present parameter setting, and alter the parameter. These parameters are grouped into a set referred to as the S registers.

All S registers may be changed with the exception of S1, the Ring count. If an attempt is made to change this parameter, the command is accepted but no action is taken. The Ring count is the number of 6-second intervals that have expired since an inbound call has been received. The current count may be displayed through the Display S register command but cannot be altered. After a call is dropped, the Ring counter is set back to 0.

If, when using the display or alter commands, no register or value number is input, the number 0 is used. For example, `ATS?` is equivalent to `ATS0`.

Allowable S registers **Table 6** shows the supported S registers allowed by the DAC. This table shows the register number, the range accepted (decimal values shown), and a description of the register. Whenever a register value is changed, the DAC checks for validity. If the value entered is not within the allowed range, all processing ceases and no command processing following the invalid entry is accepted. The DAC sends an ERROR result message.

Table 6
Allowable S registers

S register	Range	Range units	Supported	Description
S0	0–255	Rings	Yes	Number of rings to answer a system call (0 = manual answer)
S1	0–255	Rings	Yes	Ring count for the current inbound system call
S2	0–127	ASCII	Yes	Off-line escape sequence character
S3	0–127	ASCII	Yes	Input/output line terminating character
S4	0–127	ASCII	Yes	New line character for the output line
S5	0–32, 127	ASCII	Yes	Backspace character for input/output lines
S6	2–255	Seconds	No	Wait time before blind dialing
S7	1–255	Seconds	Yes	Timeout timer for far end answering
S8	0–30	Seconds	Yes	Duration for the dial pause character
S9	1–255	0.1 second	No	Carrier detect response time
S10	1–255	0.1 second	No	Delay time between loss of carrier and call release
S11	50–255	Milliseconds	No	Touch tone spacing
S12	20–255	20 milliseconds	Yes	Guard time for the escape sequence

You can view any of the S registers by issuing the following display command. Any S register can be specified through the ATS command, and the system will display the current setting for that parameter. More than one S register can be viewed by listing the desired registers on the same command line.

One register	Two registers
ATS8?	ATS8? S9
20	002
OK	006
	OK

To change any S register range, except S1, use the following change command. The new parameters remain in effect until another change command is given or the Hayes Reset modem command (Z) is issued. If the DAC is powered up, the parameters are reset to the defaults.

ATS 8 = 15
OK

Reset Hayes parameters

All of the Hayes dialing parameters and S registers remain even after the data call is complete. Similarly, if the dialing mode, keyboard to Hayes or vice versa, are changed, the parameters remain as specified. The following command allows you to reset the parameters and S registers to the defaults. Entering 0 resets to the Hayes default, while entering 1 resets to the downloaded operating parameters.

CAUTION

All previous instructions will be ignored.

This command should only be used to reset all parameters. It should be the last command entered, because all previous commands are ignored.

ATZ 0
1

OK

Table 7 lists all the parameter and S register default values. These are the values established when the reset command is given.

Table 7
Hayes parameters and S register reset values (Part 1 of 2)

Parameter	Value	Description
C	1 *	DCD control Dynamic (1) Forced ON (0)
E	1 *	Input character echo Enabled (1) Disabled (0)
Q	0	Send Result codes Enabled (1) Disabled (0)
V	1	Result codes sent in Verbose format
X	1	Features selection 0 - 8, 10 - 13
P	—	Dial method (pulse)
S0	0 *?1	Manual Answer (if 0)?Auto answer on 1 ring
S1	0	Ring count 0
S2	43	Escape sequence character Plus sign (+)
* Parameters that are reset to the downloaded operating parameters when 1 is entered at the reset command.		

Table 7
Hayes parameters and S register reset values (Part 2 of 2)

Parameter	Value	Description
S3	13	Terminator character Carriage Return (<CR>)
S4	10	New line character Line Feed (<LF>)
S5	8	Back space character BS (<BS>)
S6	2	Blind dial delay 2 seconds
S7	30	Timeout for outbound call answer 30 seconds
S8	2	Dial pause delay 2 seconds
S9	6	Carrier detect response time 0.6 seconds
S10	14	Call disconnect timer for carrier loss 1.4 seconds
S11	95	Touchtone space 95 milliseconds
S12	50	Escape sequence guard timer 1.00 seconds
* Parameters that are reset to the downloaded operating parameters when 1 is entered at the reset command.		

Outbound calls

The DAC supports two types of outbound data calls:

- point-to-point data calls
- calls sent through a modem without call origination capabilities

Hayes dialing does not provide for any alterations during call processing, Ring Again, or Controlled Call Back Queueing (CCBQ) for example. Consequently, if such variances occur during the call processing, the DAC releases the call and notifies you with a NO CARRIER or BUSY result code. **Table 8** lists the command characters allowed for an outbound call.

Table 8
Allowed outbound call command characters

Character	Description
0 - 9	Dial number normal digits
,	Delay dialing the next digit by the value set in S8 register

Inbound calls

The DAC supports auto answer and manual answer capabilities. The following commands give examples of both auto and manual answer dialogues.

This dialogue session describes the sequence when the S0 register is set to three. In this case, the DAC automatically answers the incoming call on the third ring, and the session begins with the CONNECT message.

RING

RING

RING

CONNECT

Issuing the On Hook command while the call is still ringing disconnects the incoming call. The DAC disconnects the call and notifies you with a NO CARRIER message.

RING

RING

ATH 0

NO CARRIER

When the S0 register is set to 0, the DAC is set to manual answer, and an inbound call must be answered with the Answer command. You can also abandon the call with the On Hook message, as in the Autodial sequence.

RING

RING

ATH 0

NO CARRIER

Off Line mode

Off Line mode acts as a sort of Hold mode. Once the call is answered and the session begins, the Off Line command enables you to enter Hayes command modes. The Off Line sequence is transmitted to the far-end, but at the end of the sequence, the command mode is initiated. At this point, any Hayes command except Dial Number can be executed. Once the desired command is completed, you can return to the call through the On Line command.

The Guard Time (S12 register) defines the amount of time for no local input for the Off Line escape sequence to take place. If the S12 register is set to 0, enter the escape character defined in the S2 register. For a complete list of the parameters allowed for each S Register, see [Table 7](#) describing the S Registers.

In the following example, <GT> is the Guard Time and <EC> the Escape Character defined in the S2 register. The example shows the Off Line escape sequence, the command to display an S register (Ring Count, in this case), and the command to go back on line and attend to the answered call.

<GT><EC><EC><EC><GT

OK

ATS 1

005

OK

ATO 0

CONNECT